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# Plant Spacing Influence on Sweet Corn Yield and Quality

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## Objective:

To evaluate the effect of plant densities between 30,000 and 60,000 plants to the acre on the yield and ear quality of BSS1075 sweet corn.

## Summary:

Despite the double row-planting pattern, higher plant densities were not beneficial in increasing yield, and at the highest levels, were detrimental to some ear and plant traits. The 30,000 plant/acre single or double row-planting pattern gave desirable yield and quality. Higher populations up to 36,000 plants/acre could be considered, providing double row planting technology was used, along with adequate nutritional levels and irrigation.

## Methods:

### *Fertilizer treatments*

Prior to planting, 150 pounds, or 250 pounds per acre actual nitrogen was applied as slow release, ESN Polymer coated urea (44-0-0), 150 pounds of 0-0-61, 25 pounds of sulfur, and two pounds of actual boron were broadcast and worked into the soil.

### *Planting*

Soil type was an Oakville or Spinks loamy fine sand, 0 to 3% slope combination with a CEC of 6.2 and a pH of 7.2. BSS1075 (Syngenta Seed Company) sh2 sweet corn was planted 18 May 2018 in the following manner:

1. 30,000 plants/acre: Single row 35-inches between rows and 6-inches in the row.
2. 60,000 plants/acre: Double rows, 7-inches between double rows with 35-inches center to center of double rows and 6-inches in each double row.
3. 45,000 plants/acre: Double rows, 7-inches between double rows with 35-inches center to center of double rows and 8-inches in each double row.
4. 36,000 plants/acre: Double rows, 7-inches between double rows with 35-inches center to center of double rows and 10-inches in each double row.
5. 30,000 plants/acre: Double rows, 7-inches between double rows with 35-inches center to center of double rows and 12-inches in each double row.

Planting was done using a Jang precision seeder set at the desired in-row spacing. Previous experience with the planter indicated an insufficient plant stand for the appropriate setting, so the trial was double seeded and plants thinned as needed.

Each plot consisted of eight rows, 60-feet long with the two center rows used as data rows. When the plants were approximately 12-inches tall, the best 40-feet of the best inner two rows was flagged for eventual harvest. The inner row was also used to obtain plant height and weight. The trial was separated based on the two nitrogen levels with the same plant densities used for each trial. Each spacing treatment within each nitrogen level was replicated four times, planted, and analyzed according to fertilizer level as a completely randomized design.

### ***Weed control***

After planting, pre-emergent weeds were controlled with an immediate application of Dual Magnum 7.6E and Aatrex 4L at a rate of 1.5 pints and 1 quart per acre, respectively. To control yellow nutsedge, an additional application of Sandea at 1 ounce/acre was applied on 5 June.

### ***Plant care***

The planting was overhead irrigated as needed. No fungicides were needed and the trial was harvested early enough to avoid corn earworm.

### ***Harvest and data collection***

Plots were harvested when ears were considered mature. Harvest dates were 2 August (Treatments 1 and 5) and 9 August (Treatments 2, 3, and 4). To obtain weight, marketable ears were removed and weighed with husks. Husks were then removed for ear length and diameter measurements. For plant height and weight, 10 plants were cut at the soil line, measured and weighed with ears intact. Photosynthetically Active Radiation (PAR) readings were taken at silking (12 July) in  $\mu\text{mol}$  using a Spectrum Technologies Fieldscout Light Sensor Reader equipped with a 3668i3 Quantum Light 3 Sensor Bar placed at ground level in the interior of each plot.

## **Results:**

This trial was a repeat of a 2017 trial in terms of plant density. However, the 2018 trial was planted much earlier (18 May compared to 30 June in 2017) to take advantage of higher sun angle at a critical time of plant development. The 2018 trial was also planted to a different variety. 'Cabo' was used in 2017 and it proved to be too susceptible to rust and had a propensity to produce multiple ears (bouquet ears) at the same node. There would be one large ear and one to three other smaller ears on some plants. Higher density led to noticeably higher temperature and humidity within the planting, which was thought to increase the incidence of rust. In addition, the multiple ear trait may have been detrimental to the main ear and served to reduce the number of marketable ears and over all ear quality, especially in the higher plant densities. Other changes included slow release nitrogen and two nitrogen rates.

**150# nitrogen/acre**

Differences occurred in all traits evaluated at the 150#/acre nitrogen level except stalk height (Table 1). Tons/acre ranged from 8.17 (treatment 4) to 3.59 (treatment 2) tons. Treatment 5 was statistically similar in tons/acre to treatment 4. Stalk height was the only treatment without statistical separation. Treatment 2 was the only treatment different from the leaders in photosynthetically active radiation (PAR). This is not surprising given it was the treatment with the highest plant density. The lowest density treatments (1 and 5) were leaders in ear length and stalk weight. Relative plant densities can be seen 55 days after planting in Figure 1 and 2.

Table 1. Yield of BSS1075 Sh2 sweet corn at 5 plant densities and 150 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Bold numbers in the columns are not statistically different from the leader in that column.

Approximate plant population	Tons/Acre	Dozen/Acre	Ear Length (inches)	Ear Diameter (inches)	Stalk Wt. (pounds)	Stalk Ht. (inches)	PAR* $\mu\text{mol}$
<b>30,000 (single row)</b>	5.72	<b>1711</b>	<b>10.03</b>	1.97	<b>1.40</b>	82.33	<b>116</b>
<b>30,000 (double row)</b>	7.65	<b>1950</b>	<b>9.83</b>	<b>2.07</b>	<b>1.80</b>	86.33	<b>272</b>
<b>36,000</b>	<b>8.17</b>	<b>2085</b>	8.73	<b>2.20</b>	1.19	86.00	<b>228</b>
<b>45,000</b>	5.15	<b>1670</b>	8.10	<b>2.13</b>	0.89	79.67	<b>110</b>
<b>60,000</b>	3.59	1182	8.10	<b>2.10</b>	0.97	87.33	42
lsd 0.05	<b>2.29</b>	<b>625</b>	<b>0.70</b>	<b>0.22</b>	<b>0.48</b>	ns	<b>199</b>

\*PAR = Photosynthetically Active Radiation.

**250# nitrogen/acre**

Statistical difference occurred in all traits evaluated except dozen/acre and PAR (Table 2). The two lower density treatments (1 and 5) were among the leaders in tons/acre, dozen/acre, ear length, ear diameter and stalk weight (Table 2). The highest density treatment (2) was in lowest group in every trait except ear diameter. Relative plant densities can be seen 55 days after planting in Figure 3 and 4.

As plant densities increase, it is obvious from the results of these trials that yield and quality traits will diminish. The double row technology may be worth considering since it did have some benefit at the 30,000 and 36,000 plant/acre densities. Double row planting would require an investment in a new planter, which may be something many sweet corn producers may not be willing to do. Trends in traits were similar between the 150 and 250 pound/acre nitrogen rates. Pictures taken 55 days after planting revealed

substantial between plant gaps at lower densities. Few between plant gaps were observed at the 45,000 and 60,000 plants/acre level.

Table 2. Yield of BSS1075 Sh2 sweet corn at 5 plant densities and 250 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Bold numbers in the columns are not statistically different from the leader in that column.

Approximate plant population	Tons/Acre	Dozen/Acre	Ear Length (inches)	Ear Diameter (inches)	Stalk Wt. (pounds)	Stalk Ht. (inches)	PAR* $\mu$ mol
<b>30,000 (single row)</b>	<b>7.93</b>	2489	8.55	<b>2.28</b>	<b>1.73</b>	<b>87.25</b>	359
<b>30,000 (double row)</b>	<b>7.62</b>	1999	<b>9.43</b>	<b>2.15</b>	<b>1.78</b>	83.25	264
<b>36,000</b>	<b>10.56</b>	2785	<b>9.00</b>	<b>2.13</b>	1.17	<b>90.5</b>	151
<b>45,000</b>	<b>8.14</b>	2264	<b>9.05</b>	<b>2.18</b>	1.30	<b>88.75</b>	109
<b>60,000</b>	6.65	2232	8.45	2.05	1.04	<b>93.00</b>	89
lsd 0.05	<b>3.62</b>	ns	<b>0.73</b>	<b>0.21</b>	<b>0.44</b>	<b>5.87</b>	ns

PAR = Photosynthetically Active Radiation.



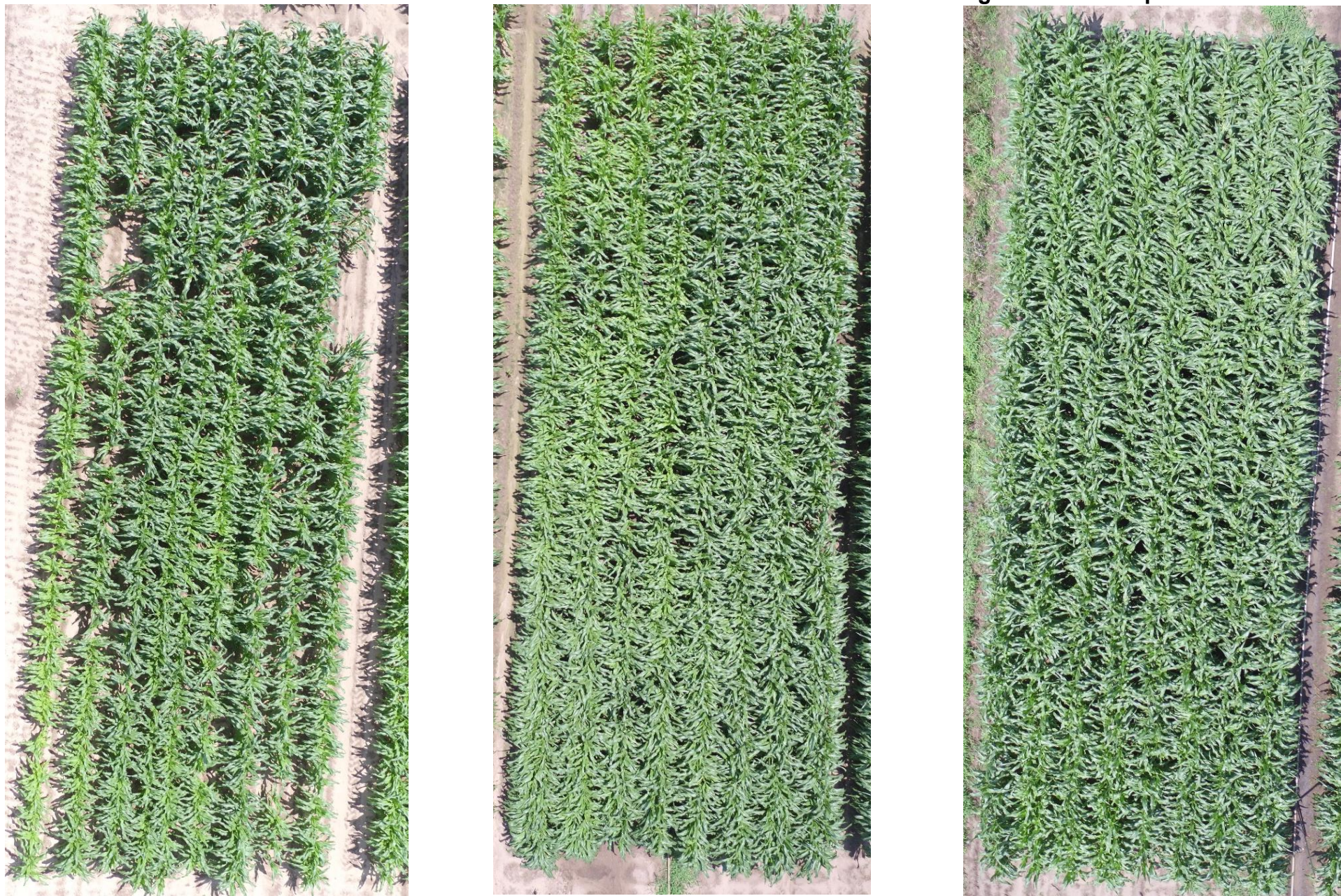


Figure 1. BSS1075 Sh2 sweet corn at three plant densities and 150 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Left to right: 30,000 plants/acre, single row; 60,000 plants/acre, double row; 45,000 plants/acre, double row. Pictures taken 55 days after planting.





Figure 2. BSS1075 Sh2 sweet corn at two plant densities and 150 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Left: 36,000 plants/acre, double row; right 30,000 plants/acre, double row. Pictures taken 55 days after planting.



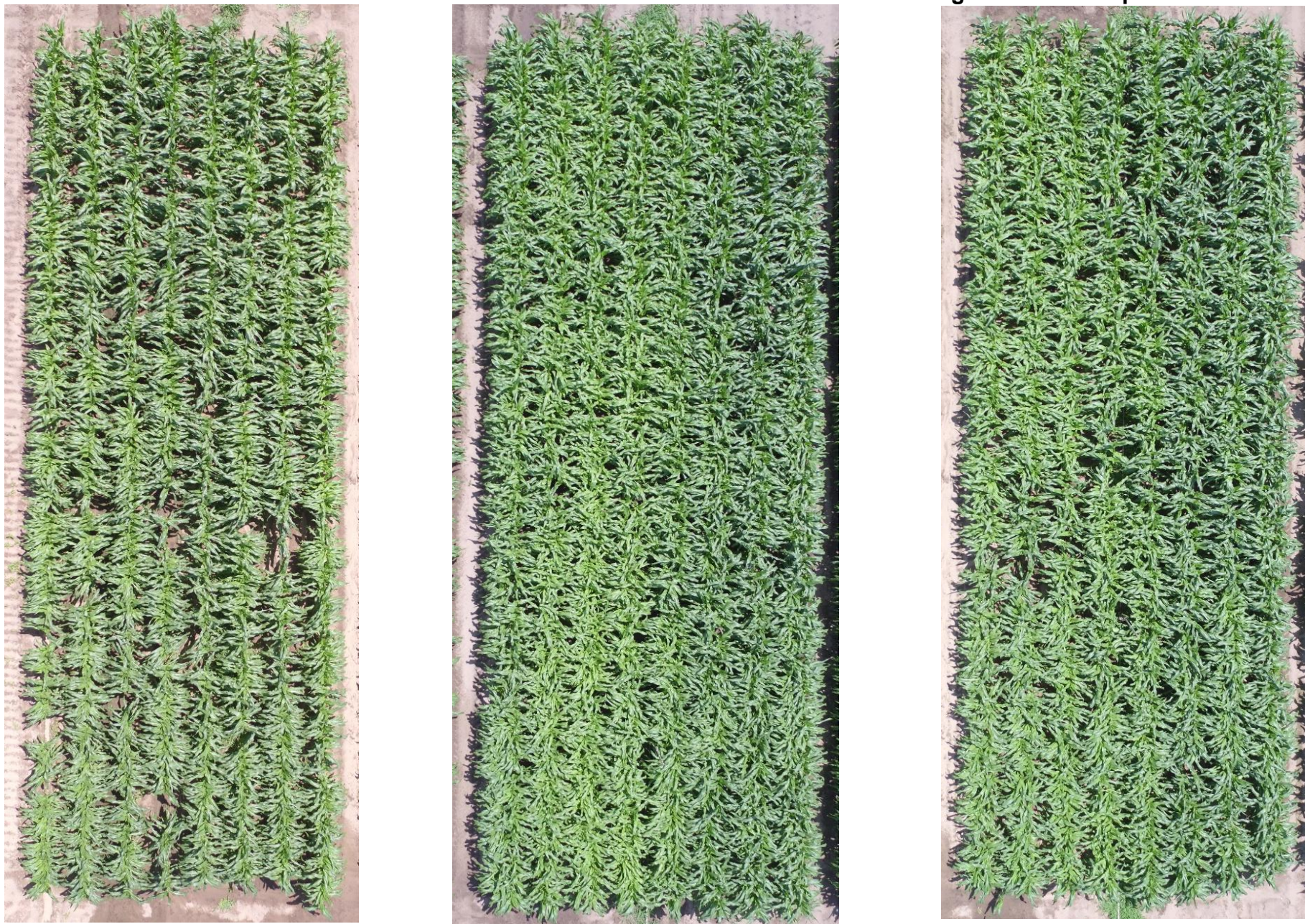


Figure 3. BSS1075 Sh2 sweet corn at three plant densities and 250 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Left to right: 30,000 plants/acre, single row; 60,000 plants/acre, double row; 45,000 plants/acre, double row. Pictures taken 55 days after planting.





Figure 4. BSS1075 Sh2 sweet corn at two plant densities and 250 pounds/acre nitrogen at the Southwest Michigan Research and Extension Center in 2018. Left: 36,000 plants/acre, double row; right 30,000 plants/acre, double row. Pictures taken 55 days after planting.